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ERRATUM

Comparison between different models of galactic tidal effects on cometary orbits

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Due to an unfortunate turn of events this article was published with the wrong version of Fig. 3 and with erroneous equations in the Appendices A–D therefore the correct version of Fig. 3 and the equations are published on the following pages and should be regarded by the reader as the final versions.

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– In Appendix A, the equation for $\left\langle \frac{\mathrm{d}\Omega}{\mathrm{d}t} \right\rangle$ should read:

$$\left\langle \frac{\mathrm{d}\Omega}{\mathrm{d}t} \right\rangle = -\frac{a^2}{4H}\Bigg\{\Big(\mathcal{G}_1-\mathcal{G}_2\Big)\Big[5\Big(1-\frac{H^2}{\mu a}\Big)\cos\Omega_r\sin\Omega_r\sin 2\omega$$
$$-2\sin^2\Omega_r\frac{H_z}{H}-\Big(1-\frac{H^2}{\mu a}\Big)\frac{H_z}{H}(3-5\cos 2\omega)\sin^2\Omega_r\Big]$$
$$+\Big(\mathcal{G}_3-\mathcal{G}_2\Big)\frac{H_z}{H}\Big[2+\Big(1-\frac{H^2}{\mu a}\Big)(3-5\cos 2\omega)\Big]\Bigg\}.$$

– In Appendix B, the equation for $\left\langle \frac{\mathrm{d}H_b}{\mathrm{d}t} \right\rangle$ should read:

$$\left\langle \frac{\mathrm{d}H_b}{\mathrm{d}t} \right\rangle = \Big(\mathcal{G}_2-\mathcal{G}_1\Big)\frac{a}{2\mu\cos^2 b(H_b^2\cos^2 b+H_z^2)}\Bigg\{-5H_b\cos^2 b\cos l_r$$
$$\times\Big(\mu a\cos^2 b-H_b^2\cos^2 b-H_z^2\Big)\Big(\sin l_r H_z+\cos l_r\sin b\cos bH_b\Big)$$
$$+\frac{1}{2}\tan bH_z^2\Big(-5\cos^2 l_r\cos^2 b(H_b^2\cos b^2+H_z^2)$$
$$+5(\sin l_r H_z+\cos l_r\sin b\cos bH_b)^2$$
$$+3(-\sin l_r\cos bH_b+\sin b\cos l_r H_z)^2-3(H_b^2\cos b^2+H_z^2)\Big)$$
$$+H_z\Big(\sin l_r\cos bH_b-\sin b\cos l_r H_z\Big)$$
$$\times\Big(\cos l_r\cos b(5\mu a\cos^2 b-4H_b^2\cos^2 b-4H_z^2)$$
$$+H_b\sin b(\sin l_r H_z+\cos l_r\sin b\cos bH_b)\Big)\Bigg\}$$
$$+\Big(\mathcal{G}_3-\mathcal{G}_2\Big)\frac{a}{2\mu(H_b^2\cos^2 b+H_z^2)}$$
$$\times\Bigg\{-5\Big(\mu a\cos^2 b-H_b^2\cos^2 b-H_z^2\Big)H_b^2\sin b\cos b$$
$$-\tan b\frac{H_z^2}{2}\Big(10\cos^2 bH_b^2+8H_z^2-8H_b^2-8\frac{H_z^2}{\cos^2 b}\Big)$$
$$-\sin b\frac{H_z^2}{\cos b}\Big(5\mu a\cos^2 b-5H_b^2\cos^2 b-4H_z^2\Big)\Bigg\}$$
$$+\mathcal{G}_2\frac{3aH_z^2\sin b}{2\mu\cos^3 b},$$

and that for $\left\langle \frac{\mathrm{d}b}{\mathrm{d}t} \right\rangle$:

$$\left\langle \frac{\mathrm{d}b}{\mathrm{d}t} \right\rangle = \left(\mathcal{G}_1 - \mathcal{G}_2\right) \frac{a}{2\mu(\cos^2 b H_b^2 + H_z^2)}$$
$$\times \left\{ \frac{H_b}{2} \left(5(\sin l_r H_z + \cos l_r \sin b \cos b H_b)^2 - 5\cos^2 l_r \cos^4 b H_b^2 \right.\right.$$
$$- 5\cos^2 l_r \cos^2 b H_z^2 + 3(\sin b \cos l_r H_z - \sin l_r \cos b H_b)^2 - 3\cos^2 b H_b^2$$
$$\left.\left. - 3H_z^2 \right) + H_z \left(\tan b \cos l_r H_z - \sin l_r H_b \right) \left(\sin l_r H_z + \cos l_r \sin b \cos b H_b \right) \right\}$$
$$+ \left(\mathcal{G}_3 - \mathcal{G}_2\right)\left(5\cos^2 b - 4\right) \frac{aH_b}{2\mu} - \mathcal{G}_2 \frac{3aH_b}{2\mu}.$$

– In Appendix C, the equation for $\widehat{\frac{\mathrm{d}a}{\mathrm{d}t}}$ should read:

$$\widehat{\frac{\mathrm{d}a}{\mathrm{d}t}} = -\frac{a^2 H}{\mu} \left\{ (\mathcal{G}_2 - \mathcal{G}_1) \left(\sin 2\Omega_r \cos 2\omega \frac{H_z}{H} + \sin 2\omega \left(\cos^2 \Omega_r - \sin^2 \Omega_r \frac{H_z^2}{H^2} \right) \right) \right.$$
$$\left. + (\mathcal{G}_3 - \mathcal{G}_2) \sin 2\omega \left(1 - \frac{H_z^2}{H^2} \right) \right\},$$

that for $\widehat{\frac{\mathrm{d}H_z}{\mathrm{d}t}}$:

$$\widehat{\frac{\mathrm{d}H_z}{\mathrm{d}t}} = (\mathcal{G}_2 - \mathcal{G}_1) \left\{ -\frac{a}{2\mu} \left(H^2 + 3\mu a \sqrt{1 - \frac{H^2}{\mu a}} \right) \right.$$
$$\times \left(\sin 2\Omega_r \cos 2\omega \frac{H_z^2}{H^2} + \sin 2\omega \frac{H_z}{H} \left(\cos^2 \Omega_r - \sin^2 \Omega_r \frac{H_z^2}{H^2} \right) \right)$$
$$\left. - \frac{5a^2}{4} \left(1 - \frac{H_z^2}{H^2} \right) \left(\cos \Omega_r \sin \Omega_r (1 + \cos 2\omega) - \sin^2 \Omega_r \sin 2\omega \frac{H_z}{H} \right) \right\}$$
$$+ \left(\mathcal{G}_3 - \mathcal{G}_2\right) \frac{a}{4\mu} \left(-2H^2 + 5\mu a - 6\mu a \sqrt{1 - \frac{H^2}{\mu a}} \right) \left(1 - \frac{H_z^2}{H^2} \right) \frac{H_z}{H} \sin 2\omega,$$

and that for $\widehat{\frac{\mathrm{d}\omega}{\mathrm{d}t}}$:

$$\widehat{\frac{\mathrm{d}\omega}{\mathrm{d}t}} = (\mathcal{G}_1 - \mathcal{G}_2) \left\{ -\frac{3aH\sqrt{\mu a}}{4\mu\sqrt{\mu a - H^2}} \left(-2\cos \Omega_r \sin \Omega_r \sin 2\omega \frac{H_z}{H} \right.\right.$$
$$\left. + \sin^2 \Omega_r (1 - \cos 2\omega) \frac{H_z^2}{H^2} + \cos^2 \Omega_r (1 + \cos 2\omega) \right)$$
$$\left. + \frac{5a^2}{4H} \left(\cos \Omega_r \sin \Omega_r \sin 2\omega \frac{H_z}{H} - \sin^2 \Omega_r (1 - \cos 2\omega) \frac{H_z^2}{H^2} \right) \right\}$$
$$+ (\mathcal{G}_3 - \mathcal{G}_2) \left\{ -\frac{3aH\sqrt{\mu a}}{4\mu\sqrt{\mu a - H^2}} \left(1 - \frac{H_z^2}{H^2} \right) (1 - \cos 2\omega) \right.$$
$$\left. + \frac{5a^2}{4H} \frac{H_z^2}{H^2} (1 - \cos 2\omega) \right\} - \mathcal{G}_2 \frac{3aH\sqrt{\mu a}}{2\mu\sqrt{\mu a - H^2}}.$$

– In Appendix D, the equation for $\widehat{\frac{\mathrm{d}a}{\mathrm{d}t}}$ should read:

$$\widehat{\frac{\mathrm{d}a}{\mathrm{d}t}} = -\frac{2a^2}{\mu}\Big\{\big(\mathcal{G}_2 - \mathcal{G}_1\big)\cos l_r\big(\sin l_r H_z + \cos l_r \sin b \cos b H_b\big) + \big(\mathcal{G}_3 - \mathcal{G}_2\big)\sin b \cos b H_b\Big\}$$

Consequently, Eq. (11a) of Fouchard et al. (2005) becomes:

$$\left\langle \frac{\mathrm{d}H_b}{\mathrm{d}t} \right\rangle = \mathcal{G}_3 \frac{a \sin b}{2\mu \cos^3 b}\Big\{5\big(-\mu a + H_b^2\big)\cos^4 b + 4H_z^2\Big\}$$

The results of Fouchard et al. (2005) are unchanged but the discussion of Section 6 can be clarified. Indeed, the force function **f** is now defined for the model $\langle L_M \rangle$ when $e = 1$. Thus the mappings $[\langle L_M \rangle]_n$ converge toward the $\langle L_M \rangle$ model even when $e = 1$.

Similarly, Eq. (12a) of Fouchard et al. (2005) becomes:

$$\widehat{\frac{\mathrm{d}a}{\mathrm{d}t}} = -\mathcal{G}_3 \frac{a^2 H}{\mu} \sin 2\omega \left(1 - \frac{H_z^2}{H^2}\right),$$

and Eq. (13a):

$$\widehat{\frac{\mathrm{d}a}{\mathrm{d}t}} = -\mathcal{G}_3 \frac{2a^2}{\mu} \sin b \cos b H_b$$

Consequently, Fig. 3 of Fouchard et al. (2005) should read:

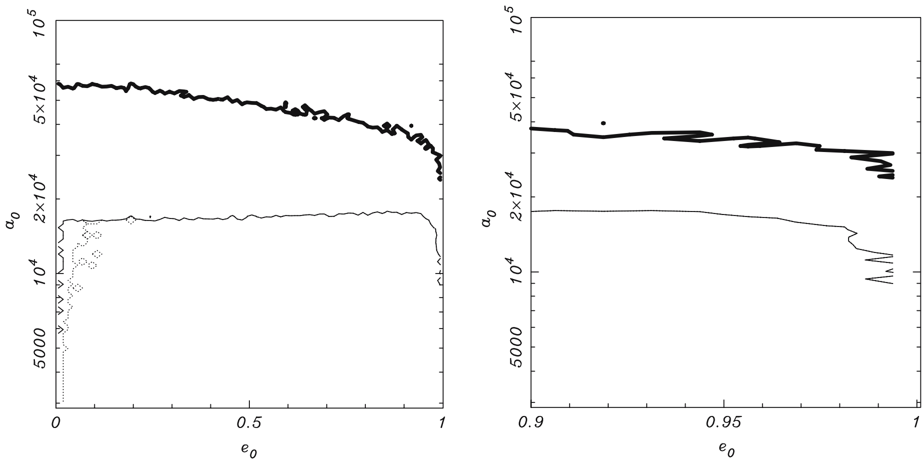

Fig. 3 Level curves in the plane $e_0 - \log a_0$ when the error E_m^* on the final perihelion for the 400,000 comets is equal to 1%. For each level curve, one has $E_m^* > 1\%$ above the level curve, and $E_m^* < 1\%$ below the level curve. Hence, the level curve corresponds to the upper bound of the domain of reliability of the model. The level curves of the $\langle H \rangle$, $\langle M \rangle$, $\langle L_H \rangle$ and $\langle L_M \rangle$ models overlap exactly, and correspond to the thick full curve, the thin full curve to the $\widehat{L_H}$ model and the thin dotted curve to the $\widehat{L_M}$ model. The figure on the right is a blow-up of the figure on the left for eccentricities greater than 0.9

Anyway, these results do not change the conclusions of Fouchard et al. (2005).